JAPANESE [JP,10-066014,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Capture the image of a desired scene into a memory, and by making the captured picture into a hard copy, this invention relates to the video printer system printed out on photographic paper, and in detail, By performing field interpolation processing by motion detection to the captured picture, a stationary part is the resolution of a frame, and a motion portion is the resolution of the field and is related with a display and the video printer system which could be made to carry out a print in a picture without blur.
[0002]
[Description of the Prior Art]Drawing 9 is a block lineblock

Drawing selection

Representative drawi

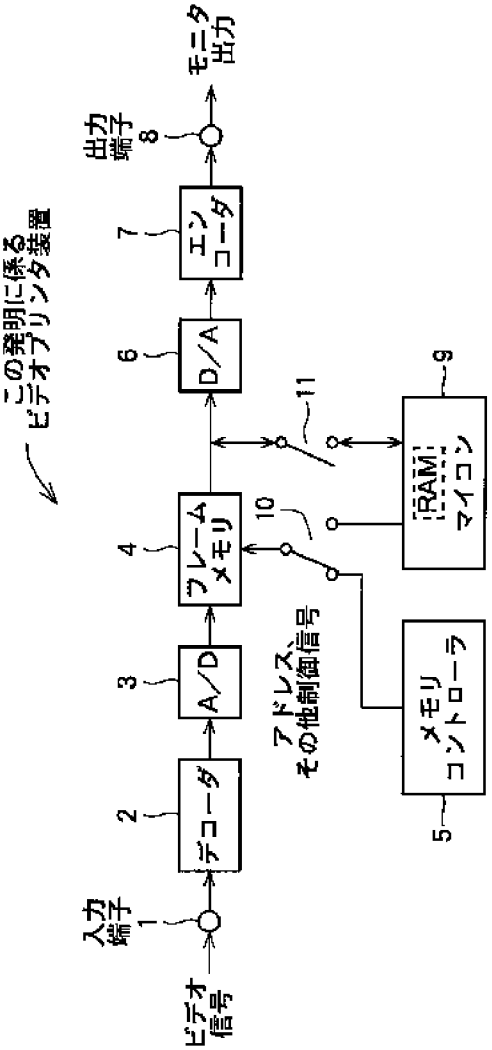

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diagram of the still picture incorporation system of the conventional video printer system, and a display system. An analog video signal is inputted into the decoder 102 via the input terminal 101. The decoder 102 changes the inputted video signal into RGB or Y (luminosity) color-difference signal. The signal outputted from the decoder 102 is changed into a digital signal with A/D converter 103. This digital signal is controlled by the memory controller 105, and is written in the frame memory 104 which can incorporate the picture signal for one frame with a video rate.

[0003]After the signal which was controlled by the memory controller 105 and read from the frame memory 104 with the video rate is changed into an analog signal with D/A converter 106, it is inputted into the encoder 107. The encoder 107 changes the inputted RGB code or Y (luminosity) color-difference signal of an analog into a video signal. The video signal from the encoder 107 is outputted to the monitor (not shown) connected to the output terminal 108.

[0004]Thus, the conventional video printer system is memorized to the frame memory 104 by using as a still picture the video signal inputted from the input terminal 101, and the memorized still picture is displayed on the screen of a monitor. Therefore, the user can check the inputted video signal as a still picture.

[0005]

[Problem(s) to be Solved by the Invention]When the picture captured into the frame memory 104 was moving by the conventional video printer system, the frame / field change over switch was scanned by a user's judgment, it switched to the field mode, and the print was displayed and carried out. For this reason, even when only a part had a motion, entire resolution is dropped, and it switches to a field mode, or there is no room of selection of only carrying out a print by a frame mode, after being ready for blur, and it might be troubled by judgment.

[0006]It was made in order that this invention might solve such a technical problem, and the optimal still picture aims at providing the video printer system automatically stored in the frame memory to arbitrary pictures.

[0007]

[Means for Solving the Problem]In order to solve said

technical problem, this invention is characterized by a video printer system comprising the following.
A motion detecting means which performs motion distinction of a picture which accessed a frame memory at a blanking period and was captured into a frame memory.
A field interpolation means which rewrites image data of a motion pixel to field interpolation data.
A scanning bar status signal creating means which generates a scanning bar status signal for carrying out the visible display of the line which is performing interpolation processing.

[0008]Since a video printer system concerning this invention was considered as composition which performs field interpolation processing by motion detection to a picture captured into a frame memory, a stationary part is the resolution of a frame, and a motion portion is the resolution of the field and can carry out the print of the picture without blur to a display row.
[0009]Since it is the composition of performing interpolation processing at a blanking period, a process in which it changes to an interpolation picture gradually can be displayed, displaying a still picture. A line which is performing interpolation processing can be displayed by displaying a scanning bar. Since an advance degree of interpolation processing can be displayed with a scanning bar, a user can be made to grasp time to that interpolation processing is performed and an end of processing.
[0010]
[Embodiment of the Invention]Hereafter, this embodiment of the invention is described based on an accompanying drawing. Drawing 1 is a block lineblock diagram of the still picture incorporation system of a video printer system, and a display system concerning this invention. This invention is characterized by a video printer system comprising the following.
The decoder 2 which changes into RGB or Y (luminosity) color-difference signal the video signal inputted from the input terminal 1.
A/D converter 3 which changes the output signal of the decoder 2 into a digital signal.
The frame memory 4 which stores the digital video signal for one frame (picture element data).
The memory controller 5 which controls the writing and

read-out to the frame memory 4, D/A converter 6 which changes into an analog signal the digital video signal (picture element data) read from the frame memory 4, The encoder 7 supplied to the monitor (image display device) which changes into a video signal RGB or Y (luminosity) color-difference signal by which D/A conversion was carried out, and is not illustrated from the output terminal 8, The microcomputer (microcomputer system) 9 which constitutes a motion detecting means, a field interpolation means, and a scanning bar status signal creating means, the selector 10 which switches the access point to the frame memory 4, and the bus transceiver 11.

[0011]A video signal is inputted into the decoder 2 via the input terminal 1. The decoder 2 changes the inputted video signal into RGB or Y (luminosity) color-difference signal. The signal outputted from the decoder 2 is changed into a digital signal with A/D converter 3. If the memory incorporation switch which is not illustrated is operated, the digital signal outputted from A/D converter 3 will be controlled by the memory controller 5, and will be written in the frame memory 4 which can incorporate the picture signal for one frame with a video rate.
[0012]It is controlled by the memory controller 5 after memory incorporation, and after the signal read from the frame memory 4 with the video rate is changed into an analog signal with D/A converter 6, it is inputted into the encoder 7. The encoder 7 changes the inputted RGB code or Y (luminosity) color-difference signal of an analog into a video signal. The video signal from the encoder 7 is outputted to the monitor (not shown) connected to the output terminal 8.
[0013]The control signal of the microcomputer 9 is considering the blanking period as the composition supplied to the frame memory 4 via the selector 10. The data bus of the microcomputer 9 is considering the blanking period as the composition connected to the frame memory 4 via the bus transceiver 11.
[0014]If the memory controller 5 starts read-out of a memory picture, the microcomputer 9 is considered as the composition which performs motion detection processing, field interpolation processing, and scanning bar display processing. It enables it to display the process changed into

the still picture which does not have by this blur of the video signal inputted from the input terminal 1 on the screen of a monitor.

[0015]The explanatory view showing the access state of a memory controller and a microcomputer and drawing 3 are time charts which show operation of a microcomputer. [as opposed to a frame memory in drawing 2] As shown in drawing 2, in a scan period, the memory controller 5 accesses the frame memory 4, and a video rate performs incorporation of image data and a display. In a blanking period, the microcomputer 9 accesses the frame memory 4 and a data transfer is performed between the frame memory 4 and RAM by the side of the microcomputer 9.

[0016]As shown in drawing 3, specifically to vertical blanking period VBLK. Several lines of the incorporated image data in the frame memory 4 are first transmitted to RAM by the side of the microcomputer 9 (S1), and in order to display it as a scanning bar, fixed data, such as red, are written in the line read now on the frame memory 4 (S2).

[0017]Next, using the data transmitted now and the data transmitted before, motion detection processing is performed at a scan period (S3), and the pixel judged to be a motion performs interpolation processing (field interpolation processing) from the line of the upper and lower sides, and writes interpolation data in RAM (S4).

[0018]Then, the image data which performed field interpolation processing is written in the line read to vertical blanking period VBLK in front of 1 vertical scanning period (1V) of the frame memory 4 at the beginning of the next vertical blanking period VBLK (S5). Field interpolation processing of the motion portion is carried out by repeating the above operation (S1-S5) of several lines at a time to the whole frame memory 4, a scanning bar being displayed in order.

[0019]Next, the algorithm of motion detection using field correlation is explained. drawing 4 -- the explanatory view of the video signal of one frame, and drawing 5 -- the -- it is an enlarged drawing in part. The video signal of one frame (the 1st field + 2nd field) is shown in drawing 4. O A seal expresses 1 pixel of a video luminance signal. - When detecting the existence of a motion of the pixel C of a seal, use the pixel of A-J of the circumference shown in drawing

5, and judge a motion by the next operation.
[0020]Here, the size of each pixel of A-J is made into a-j. K and K1 are detection coefficients.
[0021]
(a-b)x(b-c)<K(b-c)x(c-d)<K ..... (1)
When the two above-mentioned formula is realized [both], it is considered that C point is moving. Similarly, it is (e-f)x (f-c)<K(f-c)x(c-g)<K..... (2)
When the two above-mentioned formula is realized [both], it is considered that C point is moving. Similarly, it is (h-i)x (i-c)<K(i-c)x(c-j)<K..... (3)
When the two above-mentioned formula is realized [both], it is considered that C point is moving.
[0022](1) The motion with a horizontal formula, (2), and (3) types mainly detect a motion of a right-and-left oblique direction.
[0023]To a motion of a perpendicular direction, since (1), (2), and (3) are insufficient, in addition to this, it detects auxiliary in field difference.
| {(b+d) /2}-c|>K1 ..... (4)
However, before holding (4) ceremonies, it is necessary to drop horizontal sensitivity by applying level LPF compared with the usual field difference.
[0024]Eventually, when at least one of (1), (2), (3), and the (4) types is materialized, it is considered that C point is moving.
[0025]Next, operation of motion detection and field interpolation is explained. Drawing 6 is an explanatory view showing the transfer operation of image data. As shown in drawing 6, the image data of two lines (the line n, the line n +1) is newly transmitted to RAM by the side of the microcomputer 9 from the frame memory 4. RAM secures the area for five lines, uses it no less than last three lines (the line n-3 - the line n-1), and performs the following processings about each pixel of a motion detection line (line n).
[0026]Drawing 7 is a block lineblock diagram of a motion detection part and a field interpolation area. The surrounding pixel A - J point (refer to drawing 5) of a motion detection point pass along the secondary H LPF12, and are inputted into the motion detection part 13. Although the graphic display was omitted, if noise reduction processing (two-dimensional nonlinear digital filter) for

reducing random noise is performed before passing along H LPF12, a higher improvement effect will be acquired. The motion detection part 13 performs the operation shown in the motion detection algorithm ((1), (2), (3) types) of level and a right-and-left oblique direction mentioned above, and detects a motion of a pixel. Simultaneously, in order to raise the accuracy of detection, two kinds of processings shown below in addition to an elementary operation are performed here.

[0027]The detection coefficient K is switched based on the detection result on one line on the interpolation field (it is henceforth described as a two-line top). If the result on two lines is a motion, it will move and a coefficient will be switched to a twist, on the assumption that a motion has correlation. On the contrary, when the result on two lines is stillness, it is switching a coefficient to a stillness twist, and detecting accuracy is raised.

[0028]In the motion detection part 13, if an edge part is disregarded, specifically, the switch A has usually fallen on the graphic display upper part. That is, a detection operation is performed in detection coefficient K=F1. Here, detection coefficient F1 is set as the coefficient which is easy to detect a motion.

[0029]A detection result is passing along the two-line delay part 13a, and the detection result on two lines is supplied to the switch B as a switching control input of the switch B. Here, the detection coefficient F3 is set as the value from stillness compared with detection coefficient F1. Since he is trying for the switch B to fall on the upper part (state of a graphic display), otherwise, the bottom if the detection result on two lines is a motion, detecting accuracy can be raised using the continuity of a motion. It is more effective, if a level isolated point solvent wiping removal (processing which removes a horizontally isolated motion and the detected point) is performed before performing 2 line-delay processing.

[0030]Another processing performed in addition to an elementary operation is processing which switches a coefficient with level edge. In the motion detection using field correlation, level edge will also usually be judged to be a motion. In order to avoid this, a level edge part is detected and a coefficient is switched. Specifically vertical difference is calculated by the edge detection section 14, level edge is

detected, and the detection result is supplied to the motion detection part 13. In the motion detection part 13, the switch A is switched based on the detection result of level edge. By setting the detection coefficient F2 as the value from stillness compared with F1, the erroneous detection in a level edge part is reduced.

[0031]It is more effective if a level isolated point solvent wiping removal is performed also here to the detection result obtained in the motion detection part 13. Although the motion detection algorithm ((4) types) of the perpendicularly it mentioned above is omitted in drawing 7, it is more effective, if a motion of a perpendicular direction is also detected and peace is taken.

[0032]Next, expanding processing processing of the interpolation area in the interpolation area limb 15 is performed. Here, in order to compensate the leakage in detection by a motion edge part, interpolation area is expanded to five right and left and upper 1 point to detection of one point. If the pixel of - seal is specifically judged to be a motion as shown in drawing 8, interpolation area will be extended to the pixel (11 pixels of 5 pixels of right and left of the pixel of - seal [in a motion detection line], and the field interpolated line on two lines of a motion detection line) which performed hatching, and it will judge with a motion. It is better for lower 1 point to also expand interpolation area, if RAM by the side of the microcomputer 9 has a margin.

[0033]The detection result to which interpolation area was expanded is inputted into the field interpolation processing section 16. Here, when a detection result is a motion, field interpolation data is made from the value of an up-and-down line (the 1st field). On the contrary, in stillness, the value of the 2nd (interpolation) field is considered as an output as it is, without interpolating. Since it expanded by one line upwards by expansion of interpolation area, the line which performs interpolation processing is gone up to the field interpolated line of drawing 6 on two lines. In this example, although it is considered as the binary change of a motion/ stillness, in order to reduce a motion and the image quality deterioration in the switch portion of stillness, if continuous change (softswitch) processing is performed, it is more effective.

[0034]Finally the data outputted from the field interpolation

processing section 16 is written in the line (line n-3) of the top of RAM by the side of the microcomputer 7, and it transmits to the line n of the frame memory 4 by the next vertical blanking period VBLK.

[0035]

[Effect of the Invention]The video printer system applied to this invention as explained above, Since it had composition which performs field interpolation processing by motion detection to the picture captured into the frame memory, a stationary part is the resolution of a frame, and a motion portion is the resolution of the field and can carry out the print of the picture without blur to a display row.

[0036]Since it is the composition of performing interpolation processing at a blanking period, the process in which it changes to an interpolation picture gradually can be displayed, displaying a still picture. The line which is performing interpolation processing can be displayed by displaying a scanning bar. Since the advance degree of interpolation processing can be displayed with a scanning bar, a user can be made to grasp the time to that interpolation processing is performed and the end of processing. It can compare without a scanning bar display and sensibility which the time to the end of interpolation processing shortened can be given.

[Translation done.]